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Bridge Grafting  
and Inarching  
Damaged Fruit Trees

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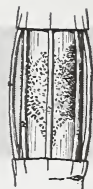


UNITED STATES  
DEPARTMENT OF  
AGRICULTURE

LEAFLET  
NUMBER 508

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RESEARCH  
SERVICE

# BRIDGE GRAFTING and INARCHING DAMAGED FRUIT TREES



Girdling of fruit trees may be caused by rodents, sun-scald, winter injury, disease, or mechanical injuries such as those resulting from cultivating.

If girdling is not repaired, the damaged trees die. Girdling is the result of destruction of the bark and living tissue that connect the roots of a tree with the part that is above the injury. Repair consists of reestablishing the connection.

Girdled trees often can be saved by bridge grafting or by inarching (approach grafting). To be successful, either type of repair must be made soon after injury.

If girdling injury is entirely above ground or if it has not seriously damaged the main roots, it can be repaired by bridge grafting. If the roots are damaged so badly that pieces cannot be grafted on them, the trees must be repaired by inarching.

These operations are suited to the repair of any kind of fruit tree that can be propagated by grafting. They are performed most successfully in early spring, about the time the trees are beginning to grow.

## BRIDGE GRAFTING

Bridge grafting consists essentially of cleaning the wounded area and connecting the bark on the lower part of the trunk or roots to the bark on the upper part with bridging members—the scions. The scions are placed about 2 inches apart around the girdled trunk. After the scions have united with the tree, they are inspected periodically and any growth—twigs or leaves—arising from them is removed.

### SCIONS

For scions, use dormant water sprouts or terminal growth from the previous season. They should be about the thickness of a lead pencil and 4 to 5 inches longer than the gap they are to bridge to allow for beveling of the ends. When they are in place, they should arch slightly in the middle.

Northwestern Greening, McIntosh, and Hibernial Crab are hardy and disease-resistant apple varieties suitable for use as scions.

The scions must be dormant. Bridge grafting usually is performed at about the time the trees are breaking dormancy and beginning to grow; you may have to collect scion material ahead of time. Scions should be stored in a refrigerator in a suitable medium to prevent drying.

## PREPARING THE TREES

Clean the injured parts by cutting away all dead tissue.

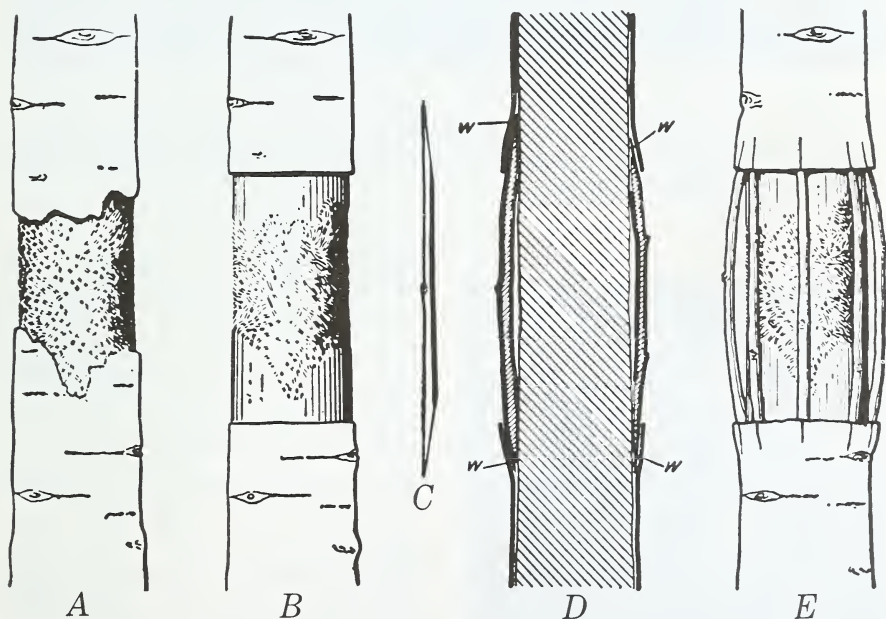
If the girdled area is entirely above ground, you need only trim the torn bark so the edges are even. If the injury extends underground, you must uncover the roots as far back as the wounds extend. Again,

trim the bark to make the edges even.

## MAKING THE UNIONS

For the scions and the tree to form a union and grow together, their cambiums—the layer between bark and wood—must be in contact. Two methods of achieving this contact are described here; they are designated as A and B.

If the bark separates easily from the wood, as it usually does on young trees, use method A. If the bark does not separate from the wood easily, use method B; this method usually is necessary for repairing old trees or injuries that extend far down the roots.



**Figure 1.**—Details of bridge grafting: A, Trunk of a tree girdled by mice; B, wound cleansed and bark along the margins trimmed back to healthy growing tissue; C, scion with beveled ends ready for insertion; D, scions in place, showing their insertion under the bark (w); E, grafting work completed except for application of protective coating.





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*Figure 2.*—Apple tree about 1 foot in diameter girdled by mice. The bark was gnawed from the roots to such an extent that scions about 3 feet long were required to bridge the wound.



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*Figure 3.*—Tree shown in figure 2 after two seasons' growth.

## Method A

Method A, illustrated in figure 1, consists essentially of sharpening the ends of the scions and inserting them under the bark of the tree.

Before inserting the ends of the scions, make vertical cuts 2 to 4 inches apart through the bark of the tree at the points where the upper and lower ends of each scion will be attached. These cuts should extend from the girdled area about  $1\frac{1}{2}$  inches into uninjured bark.

Then cut the scion so that it is slightly longer than the distance between the extremities of the two bark cuts; shape the ends so they

will fit easily under the bark. This is done by making a long, tapering cut on each end of the scions so they are shaped like thin wedges. These tapered cuts should be on the same side of the scion.

Using a knife blade or a sharpened stick, carefully lift the bark along one of the slits at the top of the girdled area. Slide the top wedge of a scion into the slit and under the bark along the slit, with the cut surface of the scion against the trunk of the tree. Be sure the scions are right end up. Push the scion end snugly under the bark at the top of the cut and drive a  $\frac{5}{8}$ -inch brad through the scion to hold it in place.

After the top of the scion is in place, flex the scion at the middle and follow the same procedure to fasten the lower end of the scion to the bottom of the girdled area.

If, as you insert the scions, the bark tends to peel away from the trunk between the scions, tack it down with a brad or two.

After all scion bridges are in place, carefully cover the wound and bark slits with protective coating.

## Method B

Method B consists of flattening the ends of the scions and inlaying them 2 to 4 inches apart, in the bark of the tree.

Make a cut in the ends of the scions about 2 inches long, parallel to the pith, and almost as deep as the pith. (See fig. 4.) This forms a flattened surface on the ends of the scions.

Cut strips of bark from the upper and lower edges of the girdled area

where the scions are to be attached. Use the flattened scion ends as patterns when making these cuts; the ends of the scions should fit tightly in the slots that are left when the bark strips are removed.

Place the upper end of each scion in its slot with its cut surface against the trunk. Be sure the scions are right end up. Tack the upper end in place, then flex the scion in the middle, place the lower end in its slot, and tack it in place.

Thoroughly cover the wound and scion ends with protective coating.

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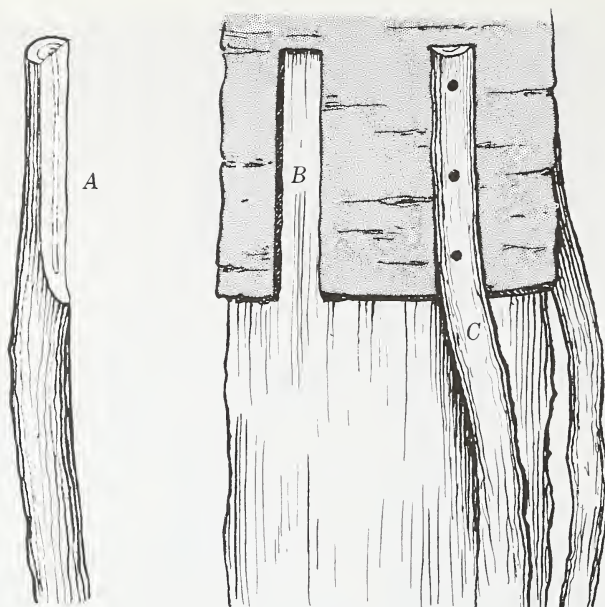
## PROTECTIVE COATING

For protective coating over injuries and ends of scions, use an asphalt-water emulsion dressing, which is available from seedsmen and garden-supply stores.

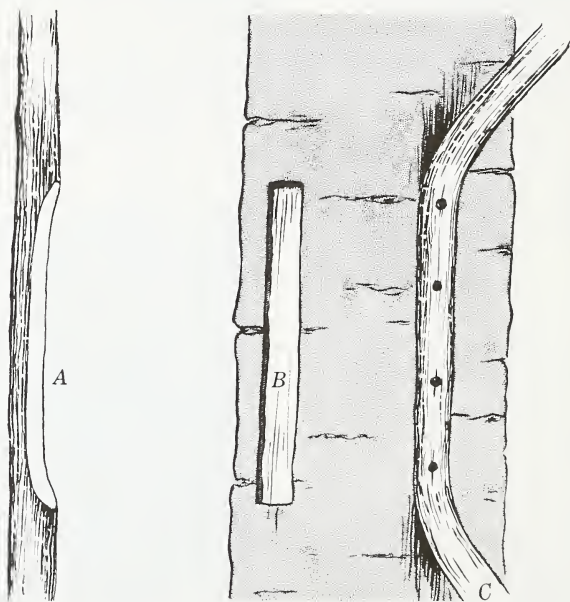
This material has many advantages over the hot grafting waxes that formerly were used as protective coatings. Asphalt-water emulsions can be thinned with water, they can be applied cold, they adhere to fresh wounds, they crack less readily with sudden temperature changes, and they dry rapidly.

Follow the manufacturer's directions for using and storing this dressing.

Inspect treated areas periodically to be sure the protective coating is intact. If the coating is broken or is peeling, apply additional material.



*Figure 4.*—Inlaying scions in bark: *A*, End of scion trimmed for inlaying; *B*, slot cut in bark the same size as the scion end; *C*, scion end inlayed in bark and fastened with brads.



*Figure 5.*—Details of inarching: *A*, Seedling with a slice cut from the bark on the side nearest the injured tree; *B*, slot cut in the bark of the injured tree; *C*, seedling inlaid in the bark slot and fastened with brads.





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**Figure 6.**—Apple tree 10 to 12 inches in diameter, badly girdled below the surface of the ground by mice. Inarching work is complete except for application of protective coating to all cut surfaces that are exposed to the air.

## INARCHING

If roots of the fruit trees are so badly damaged that you cannot attach scions to them, it will be necessary to supply a new root system for the tree. This is done by inarching—planting small trees around the base of the injured trees and grafting their tops to the trunk of the injured tree. As with bridge grafting, all growth arising

from the scion trees should be removed.

The inarching operation is illustrated in figures 5 and 6.

Plant seedlings 3 to 6 feet tall. A graft should be made every 2 to 4 inches around the trunk of the injured tree; therefore you will need several seedlings for each operation. If the seedlings are branched, each of the branches can be attached to the injured tree.



**Figure 7.**—The tree shown in figure 6 after the graft unions had grown for two seasons.

Using a sharp knife, cut a slice from the side of the seedlings nearest the injured tree. Make the slice several inches long.

Now cut slots in the bark of the injured tree. The slots should be

just large enough to make the sliced part of the seedling fit tightly.

Fasten the cut surface of the seedling against the slot in the bark of the injured tree. Use brads for this. After all the seedlings are attached, cover exposed cuts with protective coating.

It is best to leave the tops of the seedlings above the grafts until you are sure the grafts have “taken.” Then cut the tops off flush with the top of the grafted spot.

## MINOR INJURIES

Sometimes trees are not girdled completely. If even a small part of the inner bark is left between the upper and lower edges of the wound, young trees often recover without bridge grafting. The injury should be treated promptly, however, before the tissues dry out.

Paint the wounded area with a good protective coating, such as one of the asphalt emulsions, to seal the wound and prevent infection from wood rotting fungi.

Washington, D.C.

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